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(54) **PROGRAM UPDATING METHOD**

(71) Applicants: **AutoNetworks Technologies, Ltd.**, Yokkaichi, Mie (JP); **Sumitomo Wiring Systems, Ltd.**, Yokkaichi, Mie (JP); **Sumitomo Electric Industries, Ltd.**, Osaka-shi, Osaka (JP)

(72) Inventor: **Hayato Fukushima**, Yokkaichi, Mie (JP)

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(57) **ABSTRACT**

Provided is a technique for a user deciding a timing to update a program. A program that controls the operation of a device installed in a vehicle is updated. This method of updating includes a first step of determining whether or not storage of an update program for updating the program is complete, a second step of notifying that the storage is complete when a result of the determination in the first step is affirmative, and a third step of, after the second step, starting updating of the program by means of the stored update program after a predetermined instruction.

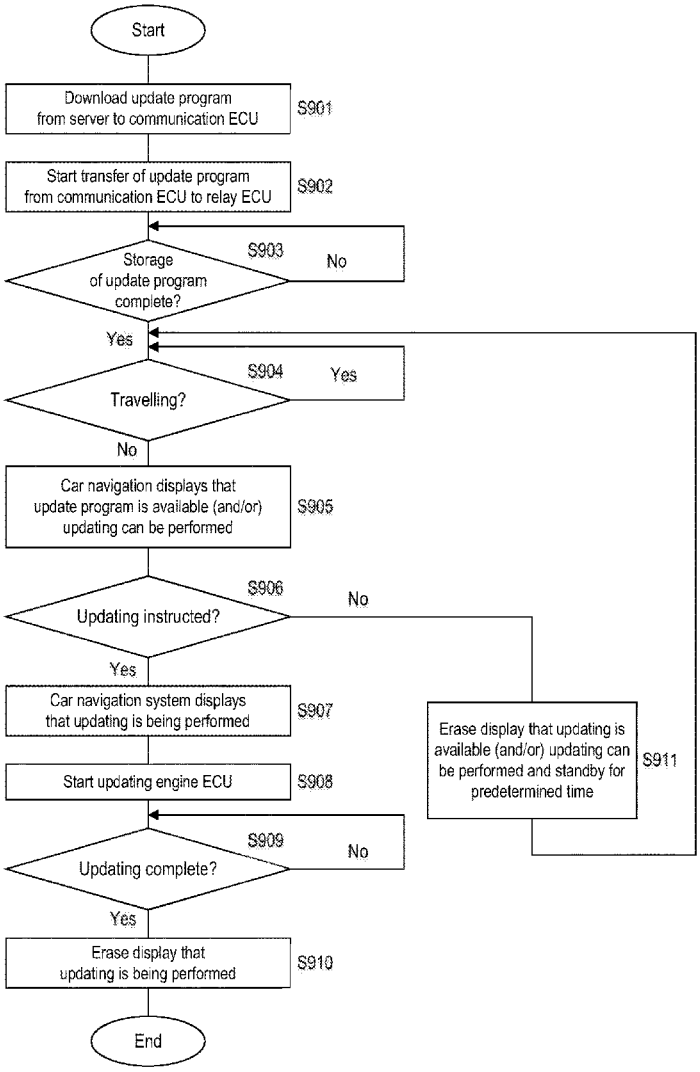


FIG. 1

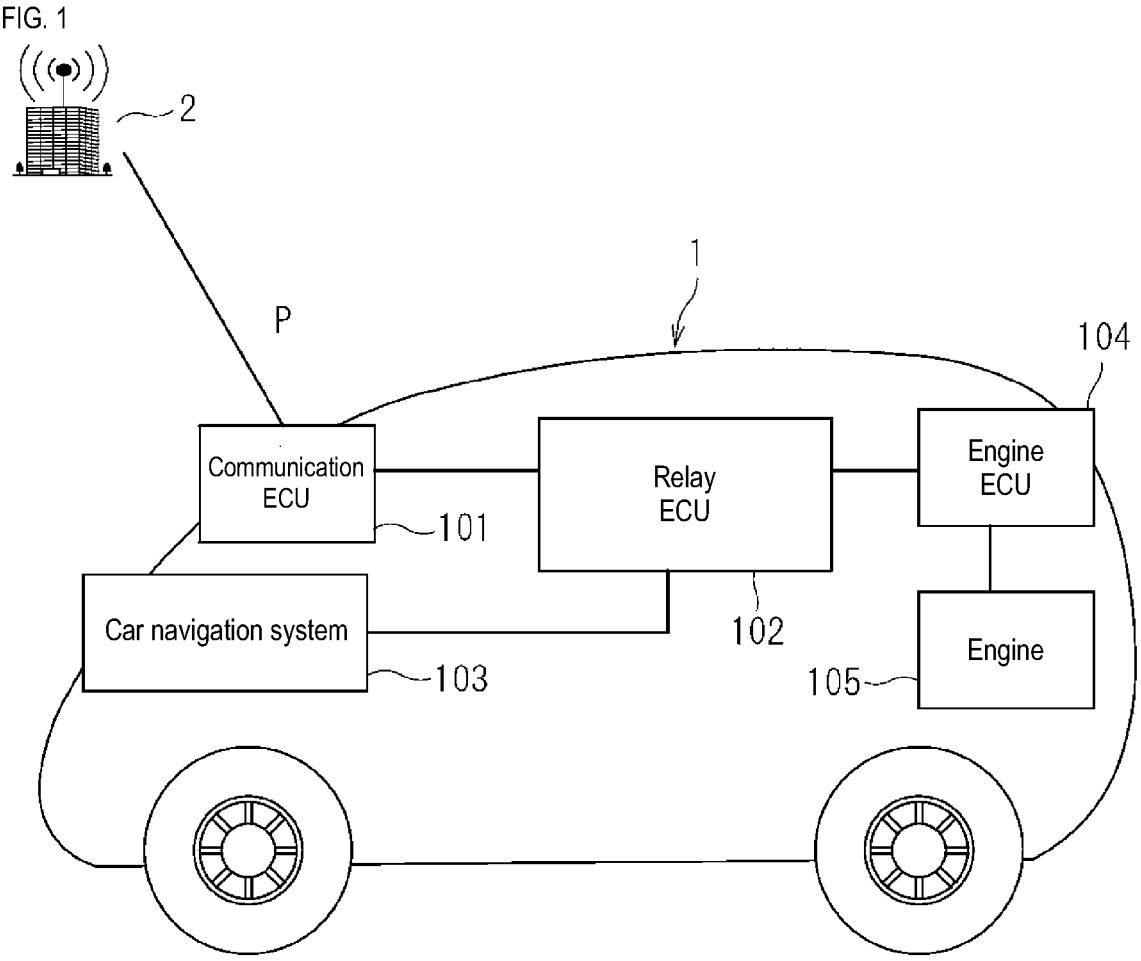

2
P
1
104
Communication ECU
101
Relay ECU
Engine ECU
Car navigation system
103
102
Engine
105

FIG. 2

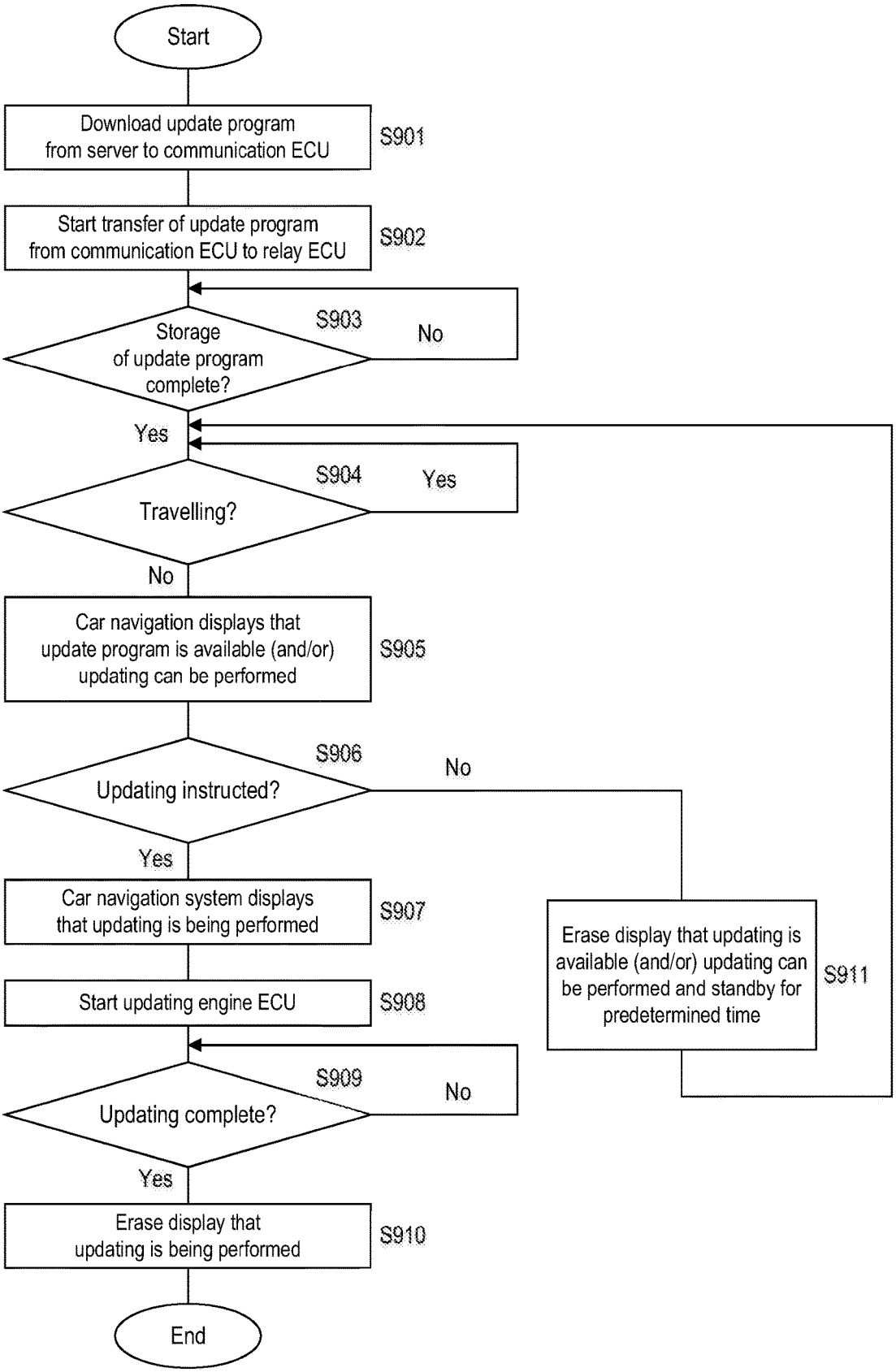

Start
Download update program from server to communication ECU
S901
Start transfer of update program from communication ECU to relay ECU
S902
S903
Storage of update program complete?
No
Yes
S904
Travelling?
Yes
No
Car navigation displays that update program is available (and/or) updating can be performed
S905
S906
Updating instructed?
No
Yes
Car navigation system displays that updating is being performed
S907
Erase display that updating is available (and/or) updating can be performed and standby for predetermined time
S911
Start updating engine ECU
S908
S909
Updating complete?
No
Yes
Erase display that updating is being performed
S910
End

FIG. 3

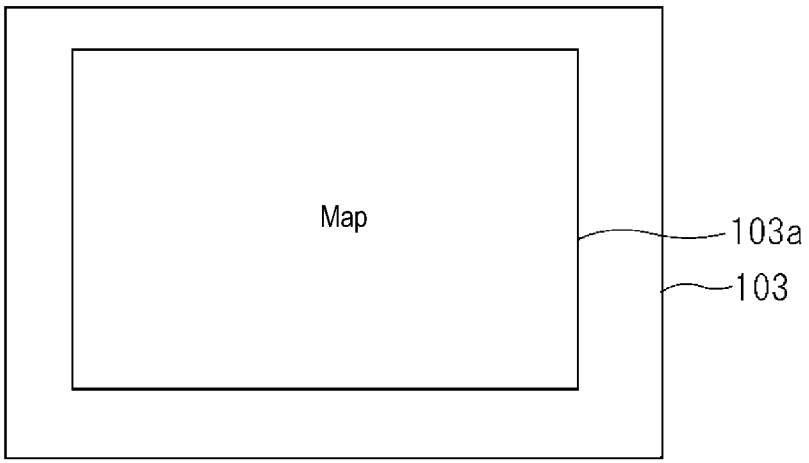


FIG. 4

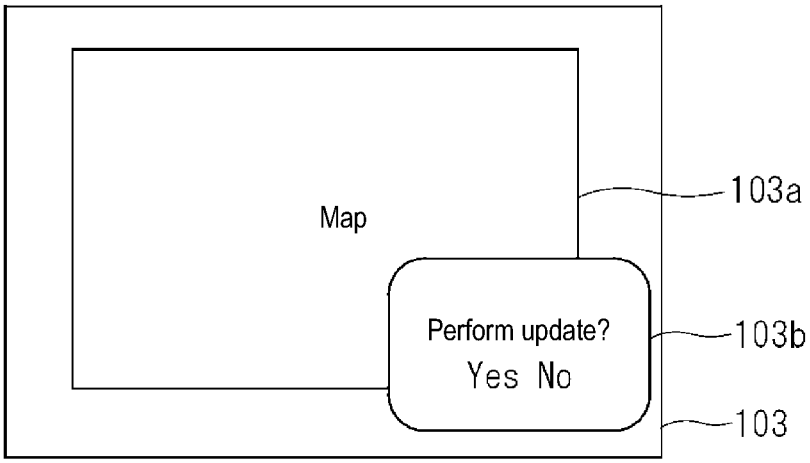


FIG. 5

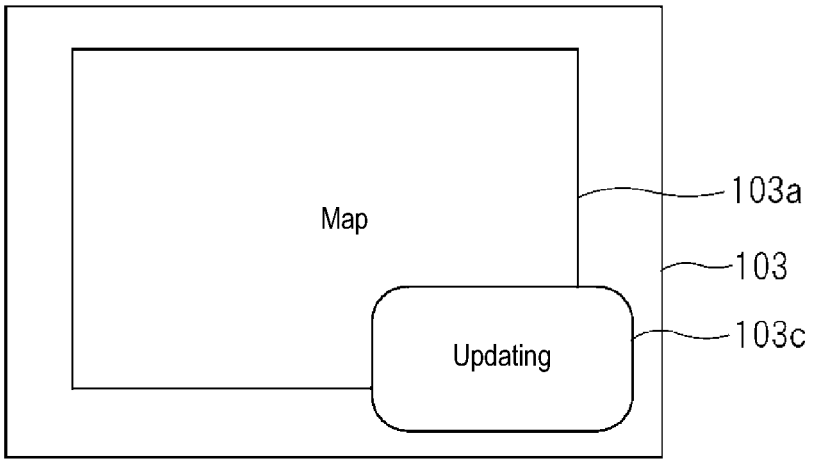


FIG. 6

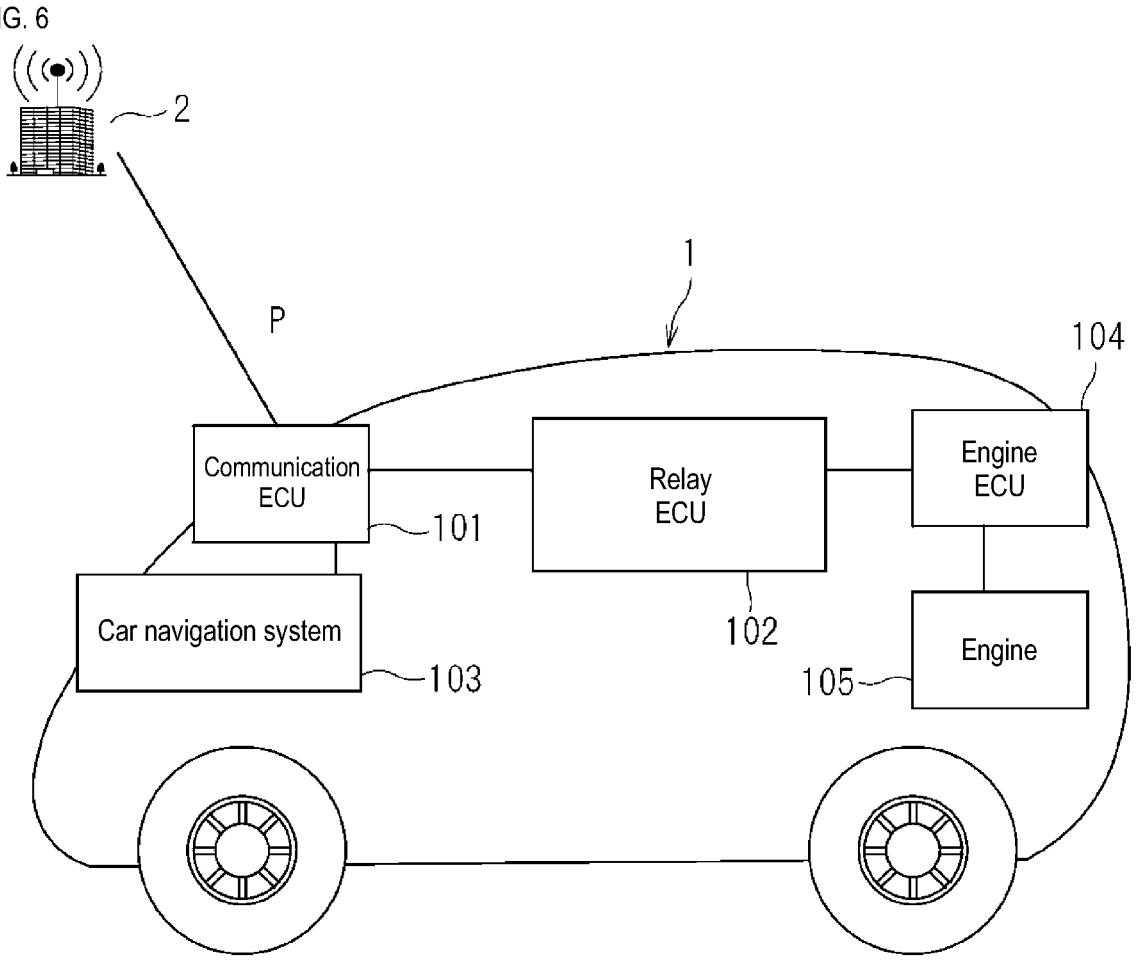

2
1
P
104
Communication ECU
101
Relay ECU
Engine ECU
Car navigation system
103
102
Engine
105

FIG. 7

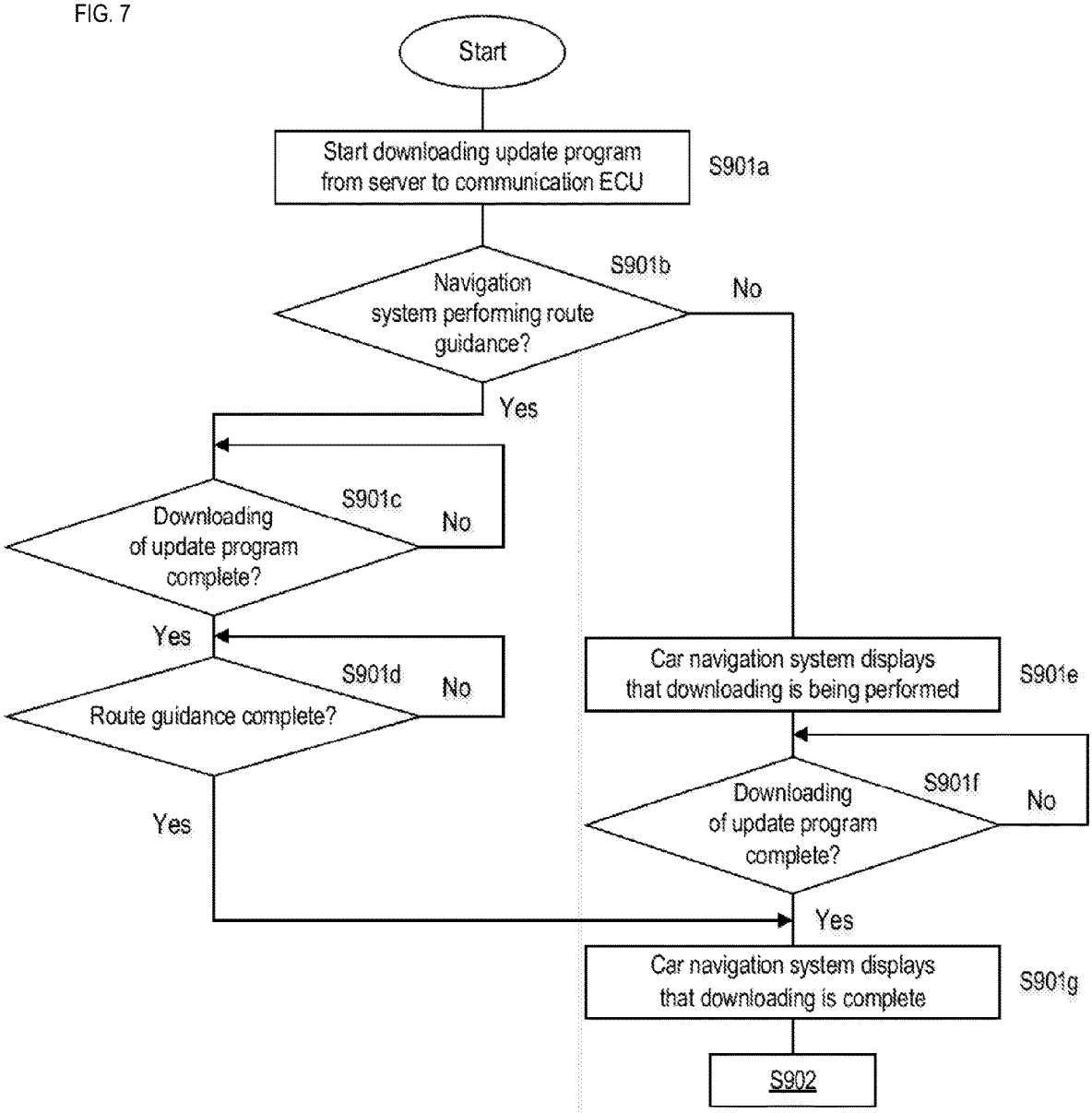

Start
Start downloading update program from server to communication ECU
S901a
Navigation system performing route guidance?
S901b
No
Yes
Downloading of update program complete?
S901c
No
Yes
Route guidance complete?
S901d
No
Yes
Car navigation system displays that downloading is being performed
S901e
Downloading of update program complete?
S901f
No
Yes
Car navigation system displays that downloading is complete
S901g
S902

FIG. 8

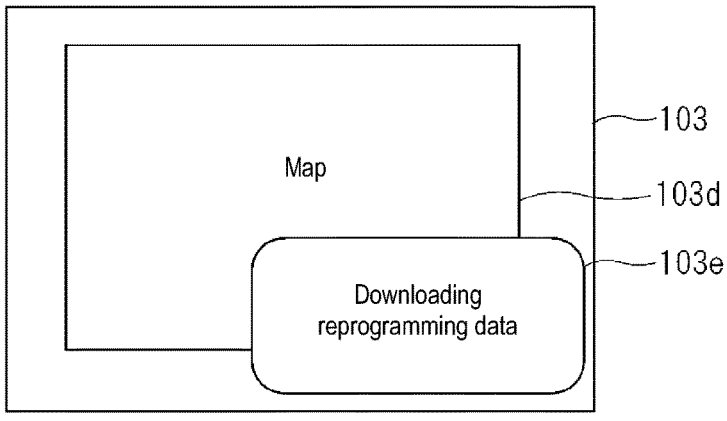

Map
103
103d
Downloading reprogramming data
103e

FIG. 9

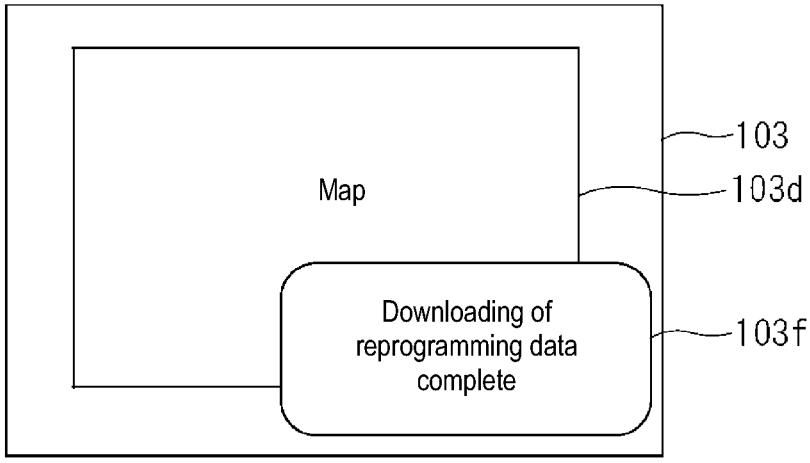

103
Map
103d
Downloading of
reprogramming data
complete
103f

FIG. 10

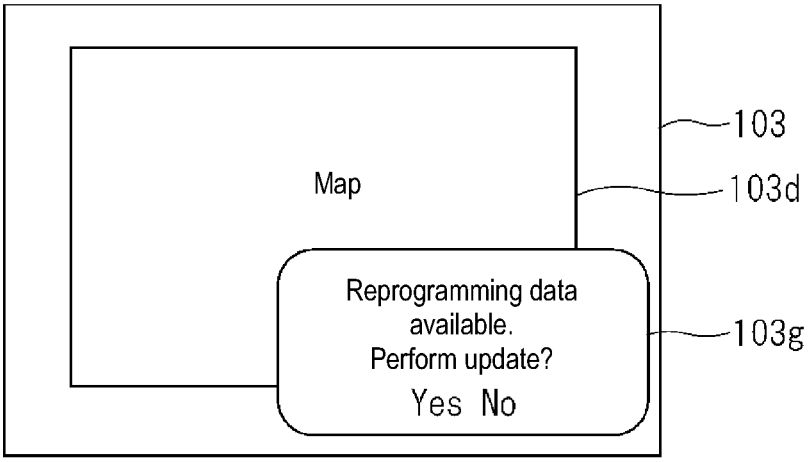

103
Map
103d
Reprogramming data
available.
Perform update?
Yes No
103g

FIG. 11

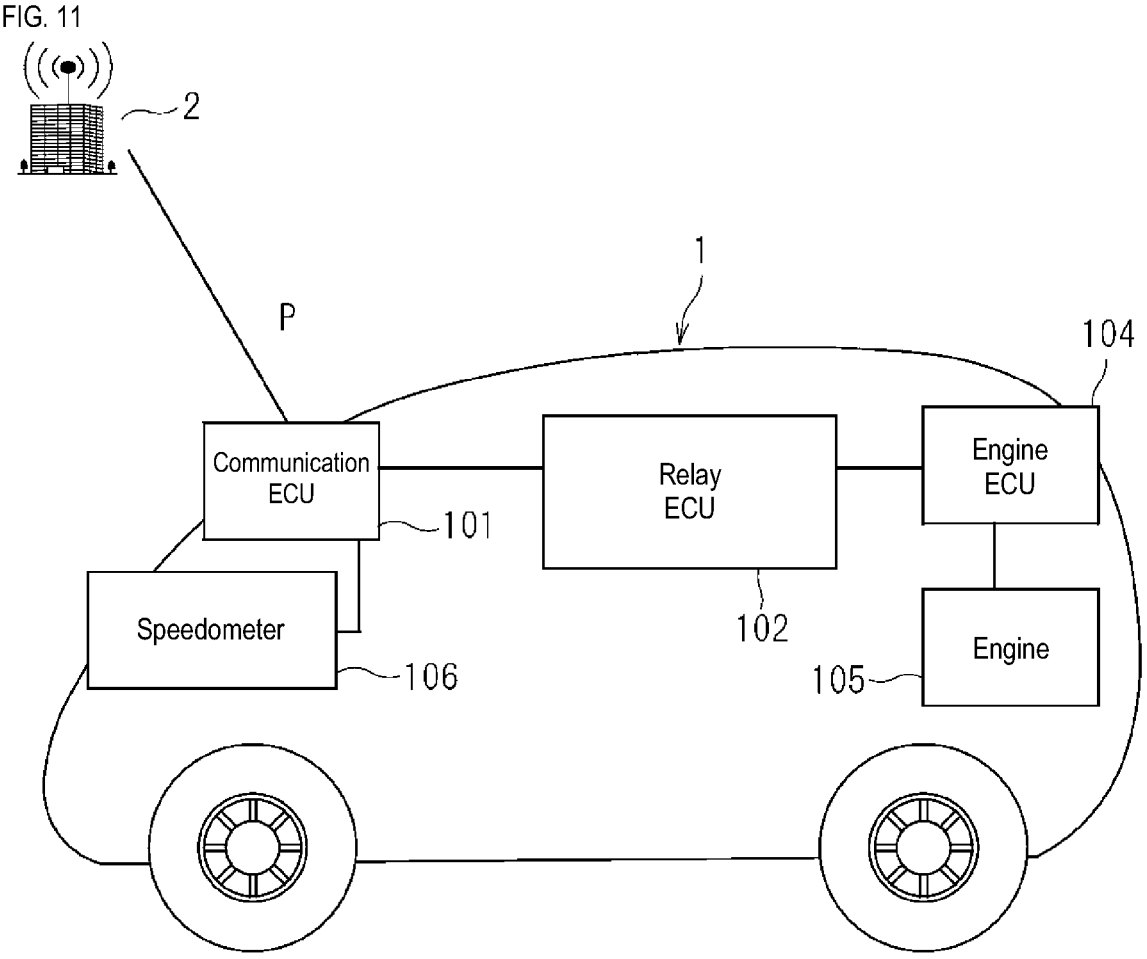

2
1
P
104
Communication ECU
101
Relay ECU
Engine ECU
Speedometer
106
102
Engine
105

FIG. 12

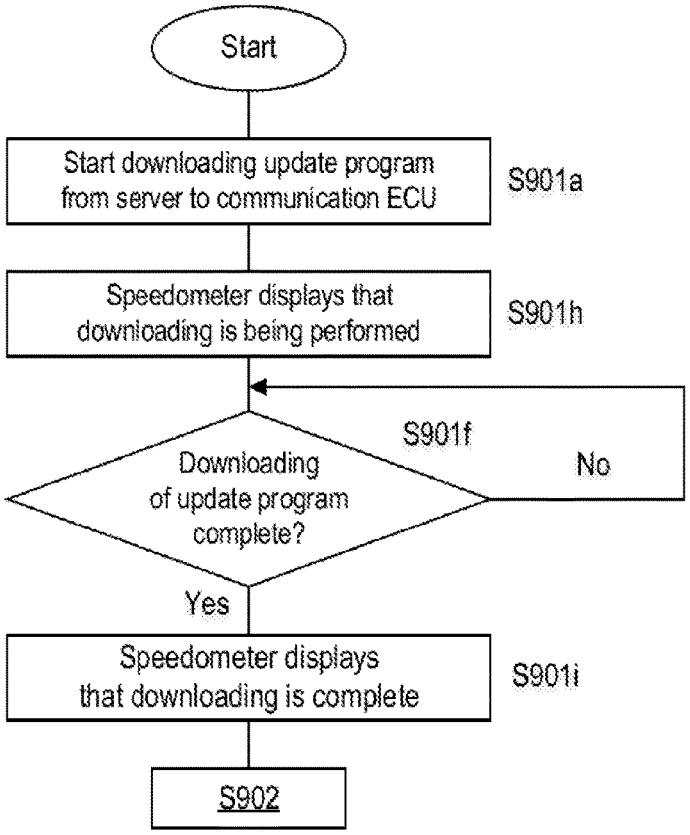

Start
Start downloading update program from server to communication ECU
S901a
Speedometer displays that downloading is being performed
S901h
S901f
Downloading of update program complete?
No
Yes
Speedometer displays that downloading is complete
S901i
S902

FIG. 13

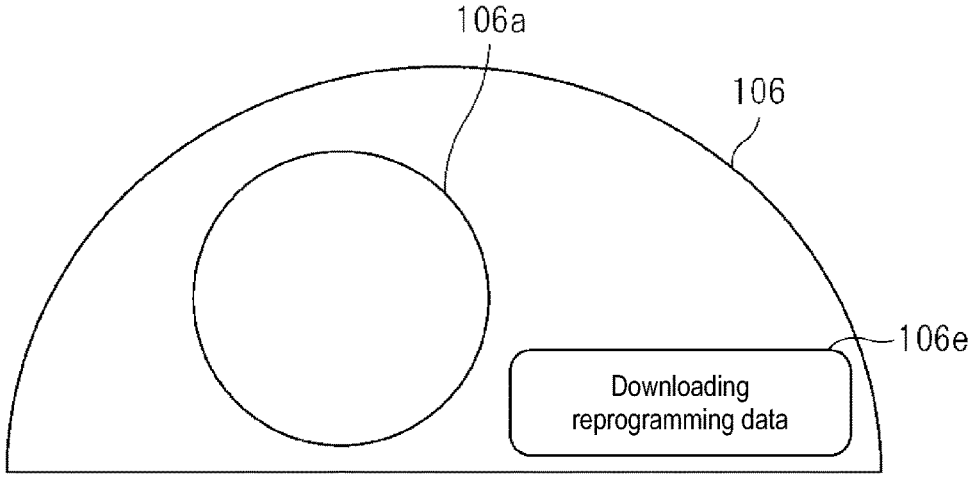

106a
106
106e
Downloading reprogramming data

FIG. 14

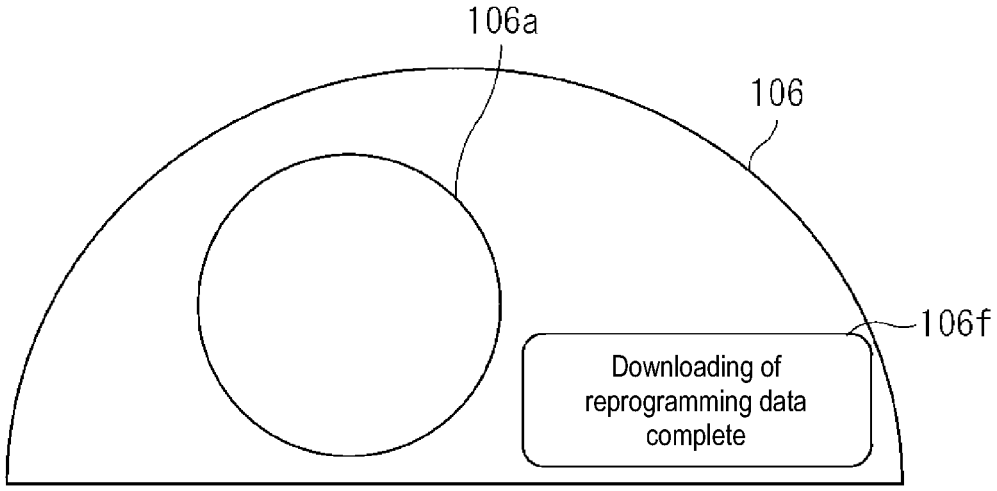
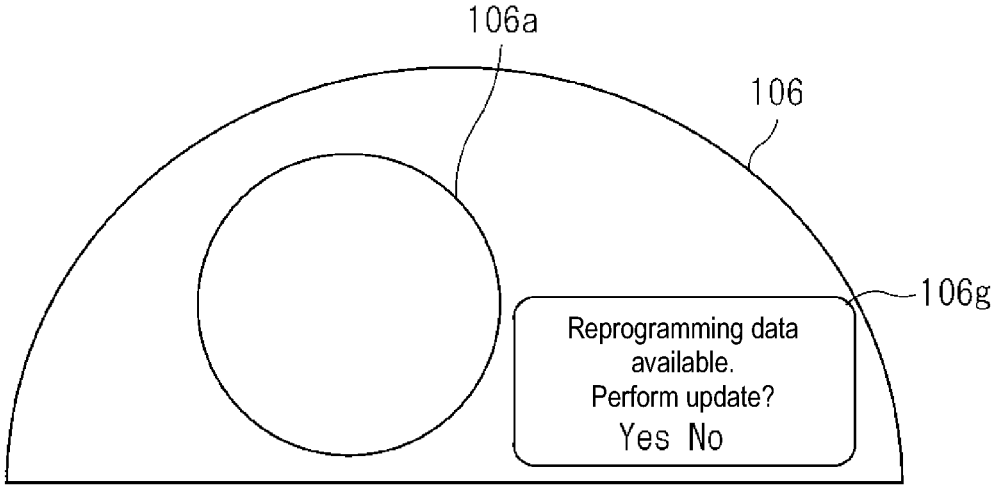

106a
106
106f
Downloading of reprogramming data complete

FIG. 15


106a
106
106g
Reprogramming data available.
Perform update?
Yes No

PROGRAM UPDATING METHOD

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is the U.S. national stage of PCT/JP2018/004164 filed on Feb. 7, 2018, which claims priority of Japanese Patent Application No. JP 2017-034991 filed on Feb. 27, 2017, the contents of which are incorporated herein.

TECHNICAL FIELD

[0002] This disclosure relates to updating a program that controls the operation of a device that is installed in a vehicle.

BACKGROUND

[0003] Electronic control units (hereinafter also referred to as 'ECUs'; same in the drawings) are known as devices that are installed in vehicles (hereinafter also referred to as 'in-vehicle devices'). These ECUs control the operation of the engine, for example. The operations of the ECUs are controlled by programs.

[0004] It is possible to update these programs (hereinafter also referred to as 'updating'). There is a well known method in which a program (hereinafter 'update program') for updating these programs is downloaded from outside of the vehicle, and the downloaded update program is used to update the programs of the in-vehicle device. For example, JP 2004-326689A listed below introduces a technique in which the update program is downloaded from a service center to the vehicle via a mobile communication network, and the downloaded update program is used to update the programs of the in-vehicle devices.

[0005] However, with the technique disclosed in JP 2004-326689A, updating programs is to be performed directly, after the update program is downloaded, as long as the update program is not abnormal (for example, steps S13, S14, and S15 shown in FIG. 3 and paragraph 0028 of JP 2004-326689A).

[0006] In this way, cases are envisaged where processing in which downloading of the update program being directly connected to updating by the downloaded update program is inconvenient to the user of the vehicle. This is because there are cases where, even though downloading can be performed while a vehicle is traveling, it is not possible to operate the vehicle while updating is being performed. For example, it may not be possible to operate the engine of the vehicle while the program of the ECU that controls the engine is updating. Conversely, it is desirable that the program of the ECU that controls the engine is not updated while the engine is operating.

[0007] In view of this, an object of the present disclosure is to provide a technique in which the timing of updating a program is determined by a user.

SUMMARY

[0008] A program updating method according to an aspect of the present disclosure is a method for updating a program that controls the operation of a device that is installed in a vehicle. The method includes a first step of determining whether or not storage of an update program for updating the program is complete, a second step of notifying that the storage is complete when a result of the determination in the first step is affirmative, and a third step of, after the second step, updating of the program starting by means of the stored update program after a predetermined instruction.

Advantageous Effects of Disclosure

[0009] In the program updating method, even when storage of the update program is complete, updating by means of the stored update program is not performed automatically. After storage of the update program is complete, a user gives a predetermined instruction and program updating is then performed. Thus, the timing of this updating can be determined by the user.

BRIEF DESCRIPTION OF DRAWINGS

[0010] FIG. **1** is a diagram showing a vehicle in which a program updating method according to a first embodiment is performed.

[0011] FIG. **2** is a flowchart showing the program updating method according to the first embodiment.

[0012] FIG. **3** is a diagram showing what is displayed by a car navigation system in the first embodiment.

[0013] FIG. **4** is a diagram showing what is displayed by the car navigation system in the first embodiment.

[0014] FIG. **5** is a diagram showing what is displayed by the car navigation system in the first embodiment.

[0015] FIG. **6** is a diagram showing a vehicle in which the program updating method according to a second embodiment is performed.

[0016] FIG. **7** is a flowchart showing the program updating method according to the second embodiment, with some parts omitted.

[0017] FIG. **8** is a diagram showing what is displayed by the car navigation system in the second embodiment.

[0018] FIG. **9** is a diagram showing what is displayed by the car navigation system in the second embodiment.

[0019] FIG. **10** is a diagram showing what is displayed by the car navigation system in the second embodiment.

[0020] FIG. **11** is a diagram showing the vehicle in which the program updating method according to a variation of the second embodiment is performed.

[0021] FIG. **12** is a flowchart showing the program updating method according to the variation of the second embodiment, with some parts omitted.

[0022] FIG. **13** is a diagram showing what is displayed by a speedometer in the variation of the second embodiment.

[0023] FIG. **14** is a diagram showing what is displayed by the speedometer in the variation of the second embodiment.

[0024] FIG. **15** is a diagram showing what is displayed by the speedometer in the variation of the second embodiment.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

First Embodiment

[0025] The following describes a program updating method according to a first embodiment. FIG. **1** is a diagram showing a vehicle **1** in which the updating method is performed. FIG. **2** is a flowchart showing the updating method.

[0026] A communication ECU **101**, a relay ECU **102**, a car navigation system **103**, an engine ECU **104**, and an engine **105** are installed in the vehicle **1**. Needless to say, other constituent elements for performing other operations are also installed in the vehicle **1**, however those other constitu-

ent elements have only a limited connection to the present embodiment and thus illustrations and descriptions thereof will be omitted.

[0027] The engine ECU **104** is an ECU for controlling the operation of the engine **105**. The engine ECU **104** is an in-vehicle device that operates based on a program and is the subject of program updating in the present embodiment.

[0028] The communication ECU **101** receives an update program P from a server **2** by communicating therewith. Thus, the update program P is downloaded to the communication ECU **101** (step S**901**). This communication may be realized through wireless communication, for example. Although omitted from the drawings, this communication can be performed via a well known communication network.

[0029] Next, transfer of the update program P from the communication ECU **101** to the relay ECU **102** is started (step S**902**). Ethernet (registered trademark), for example, may be used as the method of transferring the update program P from the communication ECU **101** to the relay ECU **102**, in which case high speed transfer is possible. A central gateway or an Ethernet switch, for example, may be used as the relay ECU **102**.

[0030] Next, it is determined whether or not storage of the update program P is complete (step S**903**). This determination may be realized by, for example, the relay ECU **102** determining whether or not the transfer of the update program P thereto is complete. Alternatively, this determination may also be realized by the communication ECU **101** determining whether or not the transfer of the update program P is complete.

[0031] If the result of the determination in step S**903** is negative (shown as "No" in FIG. **2**; the same hereinafter), that is, as long as it is determined that storage of the update program P is not complete, the determination in step S**903** is repeated.

[0032] If the result of the determination in step S**903** is affirmative (shown as "Yes" in FIG. **2**; the same hereinafter), updating of the program of the engine ECU **104** is ready to be performed by the relay ECU **102** with use of the update program P.

[0033] However, as already described, it is desirable that the program of the engine ECU **104** is not updated while the engine **105** is operating. Therefore, even if the result of the determination in step S**903** is affirmative, updating will not be performed if the vehicle **1** is traveling and, as will be described later, the user will also not be notified that downloading is complete.

[0034] Specifically, if the result of the determination in step S**903** is affirmative, processing proceeds to step S**904**. In step S**904**, it is determined whether or not the vehicle **1** is traveling. This determination can be performed by, for example, the relay ECU **102** based on the operational status of another ECU such as the engine ECU **104**.

[0035] If the result of the determination in step S**904** is affirmative, that is, as long as it is determined that the vehicle **1** is traveling, the determination in step S**904** is repeated.

[0036] If the result of the determination in step S**904** is negative, which is a state where the vehicle **1** is not traveling, processing proceeds to step S**905**. In step S**905**, the car navigation system **103** will display either one of, or both of, the update program P being available and updating being possible. This display can be executed by the car navigation system **103** with use of the control of the relay ECU **102**. Even in a state where the vehicle **1** is not traveling, as is well known, it is possible to operate, for example, the communication ECU **101**, the relay ECU **102**, the car navigation system **103**, and the engine ECU **104** with only a battery (not shown) that is typically provided in the vehicle **1**.

[0037] FIG. **3** and FIG. **4** are diagrams showing what is displayed by the car navigation system **103**. FIG. **3** shows a state where only a function inherent to the car navigation system **103**, such as the display of a map **103***a*, is displayed, and shows what is displayed by the car navigation system **103** before step S**905** is executed.

[0038] FIG. **4** shows what is displayed by the car navigation system **103** when step S**905** has been executed. In FIG. **4**, as a display showing that updating is possible, a display **103***b* is performed for choosing whether or not updating is to be performed. This display, in the present embodiment, corresponds to displaying that updating is ready to be performed, and that the update program P is available.

[0039] After step S**905** has been executed, processing proceeds to step S**906** and it is determined whether or not updating has been instructed by a user. Unlike in the technique disclosed in JP 2004-326689A, updating in the present embodiment will not be performed without this instruction.

[0040] Touch-input on a screen of the car navigation system **103** can be used as a technique for realizing a user instruction as to whether or not to permit updating. In terms of FIG. **4**, an update instruction is given by the user touching the vicinity of "Yes" in the display "Perform Update? Yes No" of the display **103***b*. Alternatively, the user can instruct to not permit updating by touching the vicinity of "No" of the display **103***b*.

[0041] If the result of the determination in step S**906** is negative, which, in terms of FIG. **4**, means that the vicinity of "No" from the display content **103***b* is touched, processing returns to step S**904** through step S**911**. In step S**911**, the display performed in step S**905**, which, in terms of FIG. **4**, is the display content **103***b*, is erased and a predetermined standby time is provided. Thus, the car navigation system **103** performs display as illustrated in FIG. **3**. Step S**911** is processing for causing the update to standby until updating is convenient for the user. The predetermined time can be, for example, one hour.

[0042] Note that after step S**911** has been executed, processing may also return to step S**905**. However, given the reason for providing step S**904**, that is, from the viewpoint of avoiding updates while the vehicle is traveling, it is desirable that processing returns to step S**904** after step S**911** has been executed.

[0043] If the result of the determination made in step S**906** is affirmative, which, in terms of FIG. **4**, means that the vicinity of "Yes" of the display **103***b* is touched, processing proceeds to step S**907**, and the car navigation system **103** displays that updating is being performed (that a program is continuing to be updated).

[0044] FIG. **5** is a diagram showing what is displayed by the car navigation system **103** when step S**907** has been executed. FIG. **5** illustrates a case where "updating" is displayed as a display **103***c*.

[0045] Processing then proceeds to step S**908**, and in step S**908** the relay ECU **102** uses the update program P to start updating the program of the engine ECU **104**.

[0046] Updating that was started in step S**908** continues, and the display **103***c* continues to be displayed until it is

determined that updating is complete. Specifically, in step S**909**, which is executed following step S**908**, it is determined whether or not updating is complete. This determination can be executed by the relay ECU **102** that uses the update program P to update the engine ECU **104**.

[0047] As long as the result of the determination in step S**909** is negative, step S**909** will continue to be executed. If the result of this determination becomes affirmative, processing proceeds to step S**910**, and the display **103***c* is erased in step S**910**. Thus, the car navigation system **103** performs the display shown in FIG. **3**.

[0048] Displaying either of the displays **103***b* or **103***c* is not a function that is inherent to the car navigation system **103**. Accordingly, it is desirable that the displays **103***b* and **103***c* are displayed such that they do not hinder visibility of the map **103***a*, which is displayed as a function inherent to the car navigation system **103**. In the examples illustrated in FIG. **4** and FIG. **5**, the displays **103***b* and **103***c* are displayed in the vicinity of the lower right hand corner of the map **103***a*.

[0049] In this way, it is determined whether or not storage of the update program P is complete in step S**903**, and when the result of the determination in step S**903** is affirmative, it is notified in step S**905** that storage of the update program P is complete. After a predetermined instruction is given after step S**905**, which is an update instruction by a user in the foregoing example, in step S**908**, program updating by means of the stored update program P is started.

[0050] Accordingly, even when storage of the update program P is complete, updating by means of the stored update program P will not be performed automatically. The program will be updated when the user gives a predetermined instruction after the user is aware of the notification informing the user that storage is complete. Thus, the user can determine the timing of the updating.

[0051] Also, step S**905** is executed after it is determined in step S**904** that the vehicle **1** is not traveling, and thus it is possible to prevent the user from mistakenly starting a download.

[0052] It is notified in step S**907** that the updating is ongoing. This is desirable from the viewpoint of preventing a user from mistakenly starting to operate an in-vehicle device (the engine ECU **104** that controls the engine **105**, for example) while updating is being performed. Note that, even if the user attempts to operate the engine **105** while the program of the engine ECU **104** is being updated (updating), this attempt will fail.

[0053] It is notified in step S**910** that updating is complete, and thus the user can be aware of the timing at which operation of an in-vehicle device can be started.

Second Embodiment

[0054] The following describes an updating method according to a second embodiment. FIG. **6** is a diagram showing the vehicle **1** in which the updating method is performed. Note that in the description of the present embodiment, constituent elements and steps that are similar to those in the first embodiment shall be denoted with the same reference numerals and descriptions thereof shall be omitted.

[0055] The communication ECU **101**, in the present embodiment, receives the update program P from the server **2** by communicating therewith, similarly to the first embodiment. However, unlike in the first embodiment, the communication ECU **101**, in the present embodiment, also controls the operation of the car navigation system **103**.

[0056] FIG. **7** is a flowchart showing the program updating method according to the present embodiment, with some parts omitted. In the present embodiment, step S**901** in the flowchart shown in FIG. **2** in relation to the first embodiment is replaced with steps S**901***a* to S**901***g* shown in FIG. **7**. Accordingly, illustration of steps S**903** to S**911** in the flowchart shown in FIG. **2** is omitted from the flowchart in FIG. **7**.

[0057] With the present embodiment, first, in step S**901***a*, downloading of the update program P from the server **2** to the communication ECU **101** is started. After downloading is started, it is determined in step S**901***b* whether or not the car navigation system **103** is performing route guidance. If the result of the determination in step S**901***b* is negative, information about the downloading is notified in the car navigation system **103**. If the result of this determination is affirmative, information about the downloading is not notified so that visibility of the route guidance is not hindered.

[0058] Generally speaking, it could be said that the vehicle **1** includes a display apparatus, such as a car navigation system **103**, for example, that has both a first function and a second function. Here, the first function is displaying predetermined information (for example, route guidance if the car navigation system **103** is used as an example of the display apparatus). Furthermore, the second function is notifying the downloading status of the update program P, such as completion thereof.

[0059] When the display apparatus is exhibiting the first function, the second function will activate after the first function stops, even if an affirmative result is obtained when determining whether or not updating of the program P is complete. On the other hand, when the display apparatus has stopped the first function (for example, in the case of simply displaying the map and not route guidance if the car navigation system **103** is used as an example of the display apparatus), the second function will activate after the result of this determination becomes affirmative. By using branched processing such as this, predetermined information is preferentially displayed over notification that the update program P has finished downloading.

[0060] The following describes an example of a specific process. If the result of the determination in step S**901***b* is affirmative, processing proceeds to step S**901***c*. In step S**901***c*, it is determined whether or not updating of the update program P is complete.

[0061] With the present embodiment, the communication ECU **101** controls the car navigation system **103** and therefore this determination can be realized by the communication ECU **101** determining whether or not the transfer of the update program P is complete.

[0062] If the result of the determination made in S**901***c* is affirmative, processing proceeds to step S**901***d*, or step S**901***c* is repeated if the result is negative.

[0063] In step S**901***d*, it is determined whether or not route guidance in the car navigation system **103** is complete. With the present embodiment, the communication ECU **101** controls the car navigation system **103** and therefore this determination can be performed by the communication ECU **101**.

[0064] If the result of the determination in step S**901***d* is negative, step S**901***d* is repeated to prioritize route guidance.

If the result of the determination in step S901*d* is affirmative, processing proceeds to step S901*g*.

[0065] If the result of the determination in step S901*b* is negative, processing proceeds to step S901*e*. In step S901*e*, it is notified that downloading is being performed. Specifically, the car navigation system **103** displays that downloading is being performed.

[0066] FIG. **8** shows what is displayed by the car navigation system **103** when step S901*e* has been executed. A map **103***d* is a map that is shown in a state where route guidance is not being performed (that is, when the first function described above has been stopped). In contrast, whether or not the map **103***a* in the first embodiment (see FIGS. **3** to **5**) is performing route guidance is irrelevant. A display **103***e* is display for notifying that downloading is being performed, and may display "Downloading reprogramming data", for example. Here, "reprogramming data" refers to the update program P.

[0067] After step S901*e* has been executed, processing proceeds to step S901*f*. In step S901*f*, similarly to in step S901*c*, it is determined whether or not downloading of the update program P is complete.

[0068] Processing proceeds to step S901*g* if the result of the determination in S901*f* is affirmative, or step S901*f* is repeated if the result is negative. In step S901*g*, it is notified that downloading is complete (which corresponds to the second function described above). Specifically, the car navigation system **103** displays that downloading of the update program P is complete. After step S901*g* has been executed, processing proceeds to step S902.

[0069] FIG. **9** shows what is displayed by the car navigation system **103** when step S901*g* has been executed. A display **103***f* is display for notifying that downloading is complete, and may display "Reprogramming data download complete", for example.

[0070] Processing from step S902 onward is performed similarly to processing in the first embodiment. FIG. **10** shows what is displayed by the car navigation system **103** when step S905 (FIG. **2**) has been executed in the present embodiment. FIG. **10** illustrates an example in which a display **103***g* showing both that the update program P is available and that updating is possible (shows a choice of whether or not to update) is displayed on the car navigation system **103**.

[0071] Needless to say, similarly to the first embodiment, the display **103***b* (FIG. **4**) may be used instead of the display **103***g* in the present embodiment. Conversely, the display **103***g* may be used instead of the display **103***b* in the first embodiment.

[0072] It is desirable that the displays **103***e*, **103***f*, **103***g* are, similarly to the displays **103***b* and **103***c*, displayed such that they do not hinder the visibility of the map **103***a* that is displayed as an inherent function of the car navigation system **103**. In the examples illustrated in FIGS. **8** to **10**, the displays **103***e*, **103***f* and **103***g* are displayed in the vicinity of the lower right hand corner of the map **103***a*.

Variations

[0073] Variation of the first embodiment and the second embodiment:

[0074] It is desirable that step S907 is, in view of the reason for the display, provided directly before or directly after step S908. Accordingly, step S907 may also be provided directly before step S908 as illustrated in FIG. **2**, or provided directly after step S908.

Variations of the Second Embodiment

[0075] If the result of the determination in step S901*c* is negative, instead of processing returning to step S901*c* and repeating that step, processing may also return to step S901*b*. With this variation, if route guidance finishes while downloading is being performed, steps S901*e* to S901*g* are executed and the car navigation system **103** can notify that downloading is being performed and that downloading is complete.

[0076] The displays in steps S901*e* and S901*g* can also be executed by means other than the car navigation system **103**. For example, the displays described above can be performed on a head-up display, a speedometer, or the like.

[0077] This variation in advantageous in that the aforementioned displays can be used to perform the notifications intended in the steps to the user even if, for example, the user does not use the car navigation system **103**. This is because a head-up display, a speedometer, and the like are visible to all users.

[0078] In this variation, steps S901*b*, S901*c*, and S901*d* shown in the flowchart in FIG. **7** are omitted.

[0079] FIG. **11** is a diagram showing the vehicle **1** in which the program updating method according to this variation is performed. FIG. **12** is a flowchart showing the program updating method according to this variation, with some parts omitted. FIGS. **13** to **15** are diagrams showing what is displayed by the speedometer **106** in this variation. FIGS. **11** to **15** correspond to FIGS. **6** to **10**, respectively.

[0080] The configuration shown in FIG. **11** is a configuration in which the speedometer **106** is installed instead of the car navigation system **103** in the configuration shown in FIG. **6**. In this variation, the speedometer **106** is, similarly to the car navigation system **103**, also an in-vehicle device that operates under control of the communication ECU **101**.

[0081] The flowchart shown in FIG. **12** is, similarly to the flowchart shown in FIG. **7**, used instead of step S901 in the flowchart shown in FIG. **2**. Steps S901*h* and S901*i* in this variation correspond respectively to steps S901*e* and S901*g* in the second embodiment, and are steps in which "car navigation system" is replaced by the "speedometer".

[0082] In FIGS. **13** to **15**, a display **106***a* is a display that the speedometer **106** usually shows, such as the traveling speed of the vehicle **1**, for example. The displays **106***e*, **106***f*, and **106***g* are the same as the displays **103***e*, **103***f*, and **103***g* (FIGS. **8** to **10**), respectively.

[0083] In this variation, "car navigation system" may also be changed to "speedometer" in steps S905 and S907 (FIG. **2**). FIG. **15** corresponds to the case in which "car navigation system" is changed to "speedometer" in step S905.

[0084] Needless to say, even if the car navigation system **103** is used, as long as the visibility of route guidance being degraded is not taken as an issue, then displays **103***e*, **103***f*, and **103***g*, similarly to displays **106***e*, **106***f*, and **106***g*, may also be displayed in a similar manner to the flowchart in FIG. **12**.

[0085] Note that configurations described in the foregoing embodiments and variations can be appropriately combined as long as there are no mutual inconsistencies.

[0086] Although the disclosure has been described in detail above, the foregoing description is intended to be illustrative in all respects, and the disclosure is not limited

to that description. It should be understood that innumerable variations that are not illustrated herein can be conceived without departing from the scope of the disclosure.

[0087] FIG. **1**

[0088] **101** COMMUNICATION ECU

[0089] **102** RELAY ECU

[0090] **103** CAR NAVIGATION SYSTEM

[0091] **104** ENGINE ECU

[0092] **105** ENGINE

FIG. **2**

[0093] スタート START

[0094] S**901** DOWNLOAD UPDATE PROGRAM FROM SERVER TO COMMUNICATION ECU

[0095] S**902** START TRANSFER OF UPDATE PROGRAM FROM COMMUNICATION ECU TO RELAY ECU

[0096] S**903** STORAGE OF UPDATE PROGRAM COMPLETE?

[0097] S**904** TRAVELLING?

[0098] S**905** CAR NAVIGATION SYSTEM DISPLAYS THAT UPDATE PROGRAM IS AVAILABLE (AND/OR) UPDATING CAN BE PERFORMED

[0099] S**906** UPDATING INSTRUCTED?

[0100] S**907** CAR NAVIGATION SYSTEM DISPLAYS THAT UPDATING IS BEING PERFORMED

[0101] S**908** START UPDATING ENGINE ECU

[0102] S**909** UPDATING COMPLETE?

[0103] S**910** ERASE DISPLAY THAT UPDATING IS BEING PERFORMED

[0104] S**911** ERASE DISPLAY THAT UPDATING IS AVAILABLE (AND/OR) UPDATING CAN BE PERFORMED AND STANDBY FOR

[0105] PREDETERMINED TIME

[0106] エンド END

FIG. **3**

[0107] 地図 MAP

FIG. **4**

[0108] 地図 MAP

[0109] **103**B PERFORM UPDATE?

FIG. **5**

[0110] 地図 MAP

[0111] **103**C UPDATING

FIG. **6**

[0112] **101** COMMUNICATION ECU

[0113] **102** RELAY ECU

[0114] **103** CAR NAVIGATION SYSTEM

[0115] **104** ENGINE ECU

[0116] **105** ENGINE

FIG. **7**

[0117] スタート START

[0118] S**901**A START DOWNLOADING UPDATE PROGRAM FROM SERVER TO COMMUNICATION ECU

[0119] S**901**B NAVIGATION SYSTEM PERFORMING ROUTE GUIDANCE?

[0120] S**901**C DOWNLOADING OF UPDATE PROGRAM COMPLETE?

[0121] S**901**D ROUTE GUIDANCE COMPLETE?

[0122] S**901**E CAR NAVIGATION SYSTEM DISPLAYS THAT DOWNLOADING IS BEING PERFORMED

[0123] S**901**F DOWNLOADING OF UPDATE PROGRAM COMPLETE?

[0124] S**901**G CAR NAVIGATION SYSTEM DISPLAYS THAT DOWNLOADING IS COMPLETE

FIG. **8**

[0125] 地図 MAP

[0126] **103**E DOWNLOADING REPROGRAMMING DATA

FIG. **9**

[0127] 地図 MAP

[0128] **103**F DOWNLOADING OF REPROGRAMMING DATA COMPLETE

FIG. **10**

[0129] 地図 MAP

[0130] **103**G REPROGRAMMING DATAAVAILABLE. PERFORM UPDATE?

FIG. **11**

[0131] **101** COMMUNICATION ECU

[0132] **102** RELAY ECU

[0133] **103** CAR NAVIGATION SYSTEM

[0134] **104** ENGINE ECU

[0135] **105** ENGINE

[0136] **106** SPEEDOMETER

FIG. **12**

[0137] スタート START

[0138] S**901**A START DOWNLOADING UPDATE PROGRAM FROM SERVER TO COMMUNICATION ECU

[0139] S**901**H SPEEDOMETER DISPLAYS THAT DOWNLOADING IS BEING PERFORMED

[0140] S**901**F DOWNLOADING OF UPDATE PROGRAM COMPLETE?

[0141] S**901**I SPEEDOMETER DISPLAYS THAT DOWNLOADING IS COMPLETE

FIG. **13**

[0142] **106**E DOWNLOADING REPROGRAMMING DATA

FIG. **14**

[0143] **106**F DOWNLOADING OF REPROGRAMMING DATA COMPLETE

FIG. **15**

[0144] **106**G REPROGRAMMING DATAAVAILABLE. PERFORM UPDATE?

1. A program updating method for updating a program that controls an operation of a device that is installed in a vehicle, the program updating method comprising:

a first step of determining whether or not a storage of an update program for updating the program is complete;

a second step of notifying that the storage is complete when a result of the determination in the first step is affirmative; and

a third step of, after the second step, starting updating of the program by means of the stored update program after a predetermined instruction.

2. The program updating method according to claim **1**, wherein

in the second step, it is notified that the storage is complete after it is determined that the vehicle is not traveling.

3. The program updating method according to claim **1**, further comprising:

a fourth step of notifying that the updating is continuing, directly before or directly after the third step.

4. The program updating method according to claim **1**, further comprising:

a fifth step of notifying that the updating is complete, after the updating is complete.

5. The program updating method according to claim **1**, further comprising:

a sixth step of starting downloading of the update program before the first step is executed; and

a seventh step of displaying that the downloading is complete, after the downloading is complete,

wherein the vehicle has further installed a display apparatus that has both a first function of displaying predetermined information and a second function of executing the seventh step,

the seventh step is, when the display apparatus is exhibiting the first function, executed after the first function has stopped even if the downloading is complete after the sixth step, and

the seventh step is, when the display apparatus has stopped the first function, executed after the downloading is complete after the sixth step.

6. The program updating method according to claim **2**, further comprising:

a fourth step of notifying that the updating is continuing, directly before or directly after the third step.

7. The program updating method according to claim **2**, further comprising:

a fifth step of notifying that the updating is complete, after the updating is complete.

8. The program updating method according to claim **3**, further comprising:

a fifth step of notifying that the updating is complete, after the updating is complete.

9. The program updating method according to claim **2**, further comprising:

a sixth step of starting downloading of the update program before the first step is executed; and

a seventh step of displaying that the downloading is complete, after the downloading is complete,

wherein the vehicle has further installed a display apparatus that has both a first function of displaying predetermined information and a second function of executing the seventh step,

the seventh step is, when the display apparatus is exhibiting the first function, executed after the first function has stopped even if the downloading is complete after the sixth step, and

the seventh step is, when the display apparatus has stopped the first function, executed after the downloading is complete after the sixth step.

10. The program updating method according to claim **3**, further comprising:

a sixth step of starting downloading of the update program before the first step is executed; and

a seventh step of displaying that the downloading is complete, after the downloading is complete,

wherein the vehicle has further installed a display apparatus that has both a first function of displaying predetermined information and a second function of executing the seventh step,

the seventh step is, when the display apparatus is exhibiting the first function, executed after the first function has stopped even if the downloading is complete after the sixth step, and

the seventh step is, when the display apparatus has stopped the first function, executed after the downloading is complete after the sixth step.

11. The program updating method according to claim **4**, further comprising:

a sixth step of starting downloading of the update program before the first step is executed; and

a seventh step of displaying that the downloading is complete, after the downloading is complete,

wherein the vehicle has further installed a display apparatus that has both a first function of displaying predetermined information and a second function of executing the seventh step,

the seventh step is, when the display apparatus is exhibiting the first function, executed after the first function has stopped even if the downloading is complete after the sixth step, and

the seventh step is, when the display apparatus has stopped the first function, executed after the downloading is complete after the sixth step.

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